

WHAT IS CLAIMED IS:

56. A laser beam producing system comprises:

a laser beam source, such as a visible laser diode (VLD), for producing a laser beam from its junction;

a collimating lens (L1) for collimating the laser beam as it is transmitted through collimating lens L1 and through the system in a P-incident manner;

a fixed spatial-frequency diffractive optical element (DOE) denotable by D1;

a fixed spatial-frequency diffractive optical element (DOE) denotable by D2; and

a focusing lens (L2) disposed after the second DOE D2 for focusing the output laser beam to some point in space.

57. The laser beam producing system of claim 56, wherein said collimating lens (L1) is realized by an optical element selected from the group consisting of a refractive lens, a HOE, a CGH, other type of DOE, a grin lens, and one or more zone plate(s).

58. The laser beam producing system of claim 56, wherein each said DOE is realized by an optical element selected from the group consisting of a HOE, a computer-generated hologram (CGH), a surface-relief hologram, and other diffractive optical element.

59. The laser beam producing system of claim 56, wherein said focusing lens (L2) is realized by an optical element selected from the group consisting of a refractive lens, a HOE, a DOE, a grin lens, zone plate(s) or the like, disposed after said second DOE D2, for focusing the output laser beam to some point in space.

60. The laser beam producing system of claim 56, wherein the total beam-shaping factor ( $M=M_1M_2$ ) for the laser beam modifying subsystem is greater than unity (1), that is  $M1*M2>1$ , and thus the laser beam leaving the collimating lens (L1) is expanded in one dimension.

72. A laser beam producing system comprises:

a laser beam source, such as a visible laser diode (VLD), for producing a laser beam from its junction;

a collimating lens (L1) for collimating the laser beam as it is transmitted through collimating lens L1 and through the system in an S-incident manner;

a fixed spatial-frequency diffractive optical element (DOE) denotable by D1;

a fixed spatial-frequency diffractive optical element (DOE) denotable by D2; and

a focusing lens (L2) disposed between DOE D1 and DOE D2 and adjustably translatable along its optical axis for focusing the output laser beam to some point in space.

73. The laser beam producing system of claim 72, wherein said collimating lens (L1) is realized by an optical element selected from the group consisting of a refractive lens, a HOE, a CGH, other type of DOE, a grin lens, and one or more zone plate(s).

74. The laser beam producing system of claim 72, wherein each said DOE is realized by an optical element selected from the group consisting of a HOE, a computer-generated hologram (CGHs), a surface-relief hologram, and other diffractive optical element.

75. The laser beam producing system of claim 72, wherein the total beam-shaping factor ( $M=M_1M_2$ ) for the laser beam modifying subsystem is less than unity (1), that is  $M1*M2<1$ , and thus the laser beam leaving the collimating lens (L1) is compressed in one dimension.

76. The laser beam producing system of claim 72, wherein each of said DOEs is realized by an optical element selected from the group consisting of a HOE, a CGH, a surface-relief hologram, and other diffractive optical element.

77. The laser beam producing system of claim 72, wherein said focusing lens (L2) is realized by an optical element selected from the group consisting of a refractive lens, holographic optical element (HOE), diffractive optical element (DOE), grin lens, and zone plate(s).

84. A laser beam producing system comprises:

a laser beam source, such as a visible laser diode (VLD), for producing a laser beam from its junction;

a collimating lens (L1) for collimating the laser beam as it is transmitted through collimating lens L1 and through the system in a P-incident manner;

a fixed spatial-frequency diffractive optical element (DOE) denotable by D1;

a fixed spatial-frequency diffractive optical element (DOE) denotable by D2; and

a focusing lens (L2) disposed between DOE D1 and DOE D2 and adjustably translatable along its optical axis during the alignment stage of the system assembly process for focusing the output laser beam to some point in space.

85. The laser beam producing system of claim 84, wherein said collimating lens (L1) is realized by an optical element selected from the group consisting of a refractive lens, a HOE, a CGH, other type of DOE, a grin lens, and one or more zone plate(s).

86. The laser beam producing system of claim 84, wherein each said DOE is realized by an optical element selected from the group consisting of a HOE, a computer-generated hologram (CGHs), a surface-relief hologram, and other diffractive optical element.

87. The laser beam producing system of claim 84, wherein each of said DOEs is realized by an optical element selected from the group consisting of a HOE, a CGH, a surface-relief hologram, and other diffractive optical element.

88. The laser beam producing system of claim 84, wherein the total beam-shaping factor ( $M=M_1M_2$ ) for the laser beam modifying subsystem is greater than unity (1), that is  $M_1*M_2>1$ , and thus the laser beam leaving the collimating lens (L1) is expanded in one dimension.

89. The laser beam producing system of claim 84, wherein said focusing lens (L2) is realized by an optical element selected from the group consisting of a refractive lens, holographic optical element (HOE), diffractive optical element (DOE), grin lens, and zone plate(s) or the like.